

## **AMENDMENTS TO THE SPECIFICATION:**

Page 1, please add the following new paragraphs before paragraph [0001]:

[0000.2] CROSS-REFERENCE TO RELATED APPLICATIONS

[0000.4] This application is a 35 USC 371 application of PCT/DE 03/01852  
filed on June 4, 2003.

[0000.6] BACKGROUND OF THE INVENTION

Please replace paragraph [0001] with the following amended paragraph:

[0001] ~~Prior Art~~ **Field of the Invention**

Please add the following new paragraph after paragraph [0001]:

[0001.2] This invention relates to an improved method of and apparatus for measuring the injection rate of an injection valve, and more particularly to the injection rate of a fuel injection valve.

Please add the following new paragraph after paragraph [0001.2]:

[0001.4] Description of the Prior Art

Page 3, please replace paragraph [0010] with the following amended paragraph:

[0010] ~~Advantages of the Invention~~

## **SUMMARY AND ADVANTAGES OF THE INVENTION**

Please replace paragraph [0011] with the following amended paragraph:

[0011] The method according to the invention ~~having the characteristics of claim 1~~ has the advantage over the prior art that from the pressure course the injection quantity can be determined in a simple way. To that end, the course over time of the pressure in the measurement volume is recorded upon injection, and the course over time of the injection quantity is calculated from that. To ascertain the factor for calculating the absolute value of

the injection quantity, the speed of sound is determined. From the pressure increase and the speed of sound, the injection quantity, or its course over time, that is, the quantity injection rate, can then be calculated directly.

Page 4, please replace paragraph [0016] with the following amended paragraph:

[0016] The apparatus of the invention ~~having the characteristics of claim 10~~ has the advantage over the prior art that the measurement signal can be better filtered. To that end, the pressure sensor is located in the pressure node of the first natural pressure oscillation, that is, the fundamental natural oscillation, so that the pressure sensor does not detect any signal from the fundamental natural oscillation. The limit frequency of the low-pass filter can therefore be shifted upward by a factor of two for smoothing out the measured pressure values.

Page 5, please replace paragraph [0017] with the following amended paragraph:

[0017] ~~Drawing~~      **BRIEF DESCRIPTION OF THE DRAWINGS**

Please replace paragraph [0018] with the following amended paragraph:

[0018] ~~In the drawing, one~~ One exemplary embodiment of the ~~apparatus of the~~ invention is shown. ~~Shown are~~ **described herein below, with reference to the drawings, in which:**

Please replace paragraph [0019] with the following amended paragraph:

[0019] Fig. 1[[,]] **is a schematic illustration of** the measurement apparatus, ~~with its~~ **schematically shown components of the invention;**

Please replace paragraph [0020] with the following amended paragraph:

[0020] Fig. 2[[,]] **is** a representation of the measurement volume with the course of pressure of the first natural pressure oscillation; and

Please replace paragraph [0022] with the following amended paragraph:

[0022] ~~Description of the Exemplary Embodiment~~

**DESCRIPTION OF THE PREFERRED EMBODIMENT**

Please replace paragraph [0023] with the following amended paragraph:

[0023] In Fig. 1, the measurement apparatus is shown in a partly sectional view. A cylindrical measurement volume 1 with a wall 2 is completely filled with a test liquid, and the measurement volume 1 is closed off on all sides. The wall 2 has a first base 102 and a second base 202, which are joined by the ~~side wall~~ **cylindrical sidewall** 303, which has a longitudinal axis 4. An injection valve 3 protrudes with its tip through an opening 10 in the first base 102 of the wall 2 into the measurement volume 1; the passage of the injection valve 3 through the wall 2 is closed off in liquid-tight fashion. The injection valve 3 has a valve body 7, in which a pistonlike valve needle 5 is longitudinally displaceable in a bore 6. By means of a longitudinal motion of the valve needle 5, a plurality of injection openings 12, which are embodied at the tip, protruding into the measurement volume 1, of the injection valve 3, are opened or closed. When the injection openings 12 are open, test liquid flows out of a pressure chamber 9, embodied between the valve needle 5 and the wall of the bore 6, to the injection openings 12, and from there is injected into the measurement volume 1, until the injection openings 12 are closed again by the valve needle 5. The injection of the test liquid is done at a high pressure, which depending on the injection valve used can be as high as 200 Mpa.

Page 6, please replace paragraph [0025] with the following amended paragraph:

[0025] A mount 22 protrudes through the second base 202 of the wall 2 into the measurement volume 1. On the end of the mount 22 is a pressure sensor 20, which

communicates via a signal line 24, which leads out of the measurement volume 1 in the mount 22, with an electronic computer 28; the passage of the mount 22 through the wall 2 is closed in liquid-tight fashion. The pressure sensor 20 is located in the center plane between the two bases 102, 202 of the wall 2 and thus ~~have~~ has the same spacing from both of the bases 102, 202. Since the pressure sensor 20 is also located on the longitudinal axis 4, it has the same spacing  $s$  on all sides from the ~~side face~~ sidewall 303. Via the electronic computer 28, the signal that the pressure sensor 20 furnishes can be read out and electronically stored in memory. To make a fast measurement of the pressure course possible, the pressure sensor 20 is constructed on a piezoelectric basis, for instance, so that even rapid changes in the pressure can be measured without significant delay. A sound transducer 21, which has the spacing  $s$  from the pressure sensor 20 is located on the ~~side face~~ sidewall 303 of the wall 2. Alternatively, it may be provided that a separate sound receiver 30 is located diametrically opposite the sound transducer 21 on the ~~side face~~ sidewall 303, so as to obtain the longest possible travel path of the sound signal and thus greater precision in determining the speed of sound  $c$ .

Page 11, please add the following new paragraph after paragraph [0041]:

[0042] The foregoing relates to preferred exemplary embodiments of the invention, it being understood that other variants and embodiments thereof are possible within the spirit and scope of the invention, the latter being defined by the appended claims.